

A BOTTOM TRAWL SURVEY FOR CRABS IN THE SOUTHERN,
KAMISHAK AND BARREN ISLANDS DISTRICTS OF THE COOK INLET
MANAGEMENT AREA, JUNE 27 - JULY 14, 1993.

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INTRODUCTION

The Department has been conducting trawl surveys for red king (Paralithodes camtschaticus) and Tanner (Chionoecetes bairdi) crabs in the Cook Inlet Management Area since 1990. The data from these surveys are used in part to generate crab population estimates. The population estimates in turn are utilized to set the quotas for the commercial fisheries.

The trawl survey replaced the pot index that was employed by the department prior to 1990 to assess the crab stocks. The pot survey data were used to establish an index of abundance which was subsequently related to commercial catch information. The shortcomings of the pot survey, such as soak variation and the relative nature of the indices themselves, induced the Department to employ a trawl survey which would allow direct stock enumeration independent of commercial fishery data.

Historically trawl surveys have been operated by both the National Marine Fisheries Service (NMFS) in the Bering Sea and the Department of Fish and Game (ADF&G) in the Westward Region. Data from these surveys have proved satisfactory in determining stock conditions and resultant fisheries management strategies for king and Tanner crabs.

OBJECTIVES

The 1993 survey goals were:

1. Determine abundance of Tanner and red king crab stocks in the Southern, Kamishak and Barren Islands Districts of the Cook Inlet Management Area (Figure 1).

2. Document the size and shell age of all Tanner, king and Dungeness (Cancer magister) crabs captured. Determine egg condition of all female crabs.

METHODS

Trawl and Area Description

The state research vessel Pandalus, overall length 66 feet, was utilized to conduct the survey. A 400 mesh eastern trawl was fished with 800 pound, 5'x 7', Nor'Eastern Astoria V trawl doors. Headrope and footrope lengths were 70 and 95 feet, respectively. The estimated fishing height and width were 9 and 40 feet, respectively. The trawl had 4.0 inch mesh in the wings and body, 3.5 inch in the intermediate and cod end, and a 1.25 inch cod end liner.

Selection of the general survey areas was based on historical pot indices, commercial catch information and preceding trawl survey results. Geographic areas that had a very limited probability of crab catch were not selected. The two general locations chosen were: 1) that portion of the Southern District from upper Kachemak Bay extending west to 152 degrees W. longitude, and 2) the Kamishak and Barren Islands Districts (referred to as Kamishak District) as far east as 152 degrees 40 minutes W. longitude (Figure 2).

Sampling Methods

Actual station sizes were initially based on those dimensions utilized in the Westward Region. Bay stations (Southern District) were 2.5 nautical miles square (6.25 sq. m.) (Figure 3) and ocean

stations (Kamishak and Barren Islands) were 5.0 nautical miles square (25.0 sq. m.) (Figure 4). Station size and shape varied somewhat based on irregular coastline and depth. Depths shallower than 10 fathoms were always precluded from station selection. Bay stations were further stratified by depth to isolate the deep water (between 50 and 90 fathoms) which essentially runs from Gull Island to Barabara Point.

Initial goals for tow length and time were 1.0 nautical miles and 30 minutes, respectively. If irregular bottom or hangups caused reduction in trawl duration, data from tow lengths of 0.5 nautical miles or greater were used. The data from shorter tows were discarded and the tows repeated. The trawl path was randomly selected within the station grid by the vessel skipper wherever it appeared that a good tow could be made. All tows were made during daylight hours.

Successful tows were brought aboard and weighed. All male king, Tanner and Dungeness crabs were weighed and measured. All female kings crabs were sampled; however, a one basket subsample of female Tanners and Dungeness was taken when the catches of these animals were large. Width measurements were used for Tanner and Dungeness crabs while length was utilized for king crabs. Shell age and egg condition information was recorded.

Finfish catches, including Pacific cod and rockfish, were sampled by the Regional Groundfish Biologist. These data will be described in a separate Regional Information Report.

Data Analysis

Abundance estimates for king and Tanner crabs in each district were generated using the following area swept equation:

$T = 151.9 (A) (C)$ where 151.9 is a factor to convert catch per nautical mile towed to catch per square nautical mile.

T = the estimated total number for each species.

A = the area of the station in square nautical miles.

C = the catch per tow in number of crabs.

These data were calculated for each station which in turn were summed to yield an estimate for the district.

RESULTS

General

A total of 36 good tows were made from June 27 through July 14, 1993. The number of stations fished in the Southern and Kamishak/Barren Islands Districts were 20 and 16, respectively. Total catches of all species and debris were 40,740 pounds in the Southern District and 16,506 pounds in the Kamishak/Barren Islands Districts.

One Southern District tow was shortened to 0.79 nautical miles due to a net hangup. Three tows in the Kamishak/Barren Islands District were shortened to 0.50, 0.89 and 0.90 nautical miles also due to net hangups (Appendices A and B).

Bottom temperatures taken from a recording device attached to the headrope of the trawl are reported for both districts in Appendix C.

Southern District

Crab catches for the Southern District were 3,190 pounds of Tanners, 175 pounds of king crabs and 786 pounds of Dungeness. The total catch of all other species and debris was 40,740 pounds (Table 1).

A total of 2,118 male Tanner crabs were caught. The majority (68%) were sublegals (<140 mm). Crabs smaller than 70 mm constituted the largest group of males captured (38%). True prerecruit ones and twos comprised 13 and 8 percent, respectively, of all the males caught. True prerecruits and recruits are new shells in the respective size classes. The legal male catch was 32 percent (675) of all age classes combined. True recruits constituted 53 percent of the legal male catch (Table 2 and Figure 5). The average width of the legal males was 154 mm (6.07 inches).

A total of 1,487 female Tanner crabs were caught. Of these, 721 (48%) were juveniles and the remaining 766 were adults. Of the adult females, 698 (97%) had full clutches. Seventy seven (10%) of the adult females were newly mature (Table 3 and Figure 6). All eggs were uneyed.

Fifteen male king crabs were caught. King crabs were caught in six of the 20 stations towed. Legal animals accounted for eight of the 15 males. The legal segment of the catch was comprised of one recruit and 7 post-recruits (88%). No juveniles were captured (Table 4).

Twenty one female king crabs were caught in three stations. Eighteen were adults and three were juveniles. All but one were new shelled. None of the adult females were barren. Three (17%) had full clutches (Table 5). Average fecundity was 71 percent and all eggs were uneyed.

One hundred thirty six male Dungeness crabs were captured. The average width was 166 mm and sizes ranged from 136 to 188 mm. Seventy six crabs (55 %) were legals. Of the 76 legals, 67 (88%) were true recruits. Forty eight (84%) of the 57 prerecruit ones were new shelled (true prerecruit ones) (Table 6). Twenty three (17 %) of all males were in a soft shell condition. Fifteen (20%) of the legals were soft; all were recruits. Eight (13%) of the sublegals were soft; all were prerecruit ones. The majority of the males captured represent two size and age classes (Figure 7).

The female Dungeness catch numbered 534 animals. The average width was 141 mm and sizes ranged from 126 to 169 mm. Three hundred eighty four (72%) were new shells. No females were bearing eggs (Table 7). Seven juveniles were clearly identified by virtue of size (Figure 8). If other juveniles were captured, they could not be identified since there are no external indicators of sexual maturity other than the presence of eggs: even the obvious adults are not bearing eggs at this time of year.

Kamishak and Barren Islands Districts

Crab catches in the Kamishak and Barren Islands Districts were 560 pounds of Tanners and 9 pounds of king crabs. No Dungeness crabs were caught. The total catch of all other species and debris was 15,937 pounds from 16 tows (Table 8).

A total of 499 male Tanner crabs were caught. Sublegals in the prerecruit one and two size classes dominated the catch with 71 percent (256) of the males captured. The majority (79%) of the prerecruit ones were skip-molts (old shells). Conversely, 71 percent of the prerecruit twos were new shelled. Legal male crabs comprised six percent (22) of the catch. Skip molts made up the major portion (79%) of the legals. Fifty percent (251) of the males were caught in two stations (Table 9 and Figure 9). The

average width of the legal males was 146 mm (5.74 inches). Black mat was found on four very old shell male Tanner crabs.

A total of 310 female Tanner crabs were caught. Of these, 100 were juveniles and 210 were adults. One hundred sixty nine (80%) of the adult females were newly mature (Table 10 and Figure 10).

Two male king crabs were captured, one adult and one juvenile (Table 11). No female king crabs were caught.

Tanner Crab Population Estimates

Tanner crab population estimates of catchable males and females were 1,671,636 and 1,174,592 crabs, respectively, for the Southern District. Estimates for the Kamishak and Barren Islands District were 1,963,885 males and 1,216,131 females. The estimates of legal male Tanner crabs were 524,319 and 110,674 for the Southern and Kamishak/Barren Islands Districts, respectively (Table 12). True recruits composed 54 percent of the legal male stock in the Southern District, and 21 percent in the Kamishak and Barren Islands Districts.

King Crab Population Estimates

The population estimate of catchable male king crabs in the Southern District was 11,984 crabs. The estimate of catchable female king crabs was 17,615 animals.

The Kamishak/Barren Islands Districts' catch yielded a population estimate of 3,758 males.

DISCUSSION

King crab

Compared to historical commercial catch figures, which only reflect the numbers of legal males, the overall population level of king crabs remains severely depressed in both the Southern and Kamishak/Barren Islands Districts. For example, the mean commercial catch prior to the final 1984 closure was 3.44 million pounds per year. Assuming an average weight of 6.5 pounds per crab, the 3.44 million pounds equals approximately 530,000 legal males. This compares to a 1993 total male population estimate of 15,742 crabs, or three percent of the historical mean commercial catch.

In 1994 the department will continue its efforts to improve the crab trawl surveys. In order to consider potential early king crab migration, the 1994 Kamishak/Barren Islands Districts survey will be advanced to the month of June. If the historical migration of adult king crabs out of the Cook Inlet Management Area into northern Shelikof Strait is still occurring, then a June survey date should allow for assessment of these animals prior to the migration. Based on fishermen interviews and ancillary department information, it appears that July has been a pivotal month for king crab movement out of the Kamishak/Barren Islands Districts; therefore, the existing July survey should have assessed the stock prior to movement. Furthermore, it appears that only a portion of the stock migrated in June and July because catch data indicate that substantial animals remained available for harvest in Cook Inlet in August and September. Finally, review of recent stock assessment data from the Kodiak Management Area trawl survey, which includes Shelikof Strait, does not indicate any substantial number of king crabs. Nevertheless, the 1994 survey will occur in June to

assure that no avenue to improved stock assessment is left unexplored.

Tanner crab

Southern District

Since 1990 the trawl surveys in the Southern District indicated that the Tanner crab stock was staging a modest recovery from documented lows (Figure 11). Limited commercial fisheries were permitted in 1991 through 1993 (Table 13). The surveys also showed that the improvement would be followed by another downturn in abundance. The reduced recruitment identified by the 1993 survey is representative of this decline. Furthermore the depressed numbers of prerecruit ones, twos and threes show a high probability of a continuing decrease in recruitment for the next three years (Figure 5).

The 600,000 crabs in the size group of 70 mm and less are the largest enumeration of this classification since the inception of the survey (Table 12 and Figure 5). The accuracy of the trawl as an assessment tool for these small animals remains unverified. At best the number of these crabs is an indicator of abundance. Even if these animals actually are present in the abundance exhibited by the trawl catches, natural mortality is likely to have a significant impact on their survival and eventual recruitment, which is at least four or five years away.

Kamishak and Barren Islands Districts

The stock in the Kamishak and Barren Islands Districts continues to be depressed. This condition is evidenced by both the data from the Cook Inlet and the Kodiak trawl surveys: Kodiak ADF&G tows

south of the latitude of Cape Douglas and Cook Inlet ADF&G trawls north of Cape Douglas. Based on comparison to past trawl survey data and historical commercial catch, the 110,000 legal animals estimated by the 1993 trawl survey is a record low for this group of crabs.

The prerecruit one size class is dominated (79 percent) by skipmolts. These animals will not likely molt again which means they will never recruit into the fishery. The 523,000 crab population estimate of new shell prerecruit two males is a relatively large number of animals particularly when compared to the other age and size classes (Table 12 and Figure 9). However the characteristic skipmolting of the Kamishak stock in the prerecruit one and two size classes may prevent up to fifty percent of these animals from eventually recruiting into the legal portion of the stock.

Dungeness crab

The Southern District trawl surveys have recognized a group of Dungeness males as they move through the successive years. Although the survey was not designed to assess the Dungeness crab stock(s), the data seem to agree with the results of the Southern District Dungeness pot survey. The 1993 data indicate an overall reduction in the males that constituted the year class dominating the trawl survey since 1990. The magnitude of this group is declining as both natural mortality due to old age and the harvest from the recreational fishery begin to be significant (Figure 12).

Table 1. Target species catch in pounds by station in the Southern District, Cook Inlet trawl survey, 1993.

Station no.	Tanner	Dungeness	King	Misc. invertebrates, fish & debris	Total catch
1	187	6	75	1204	1472
2	72	10	42	974	1098
3	61	64	0	961	1086
4	144	78	0	1764	1986
5	83	14	0	835	932
6	92	6	20	2048	2166
7	114	74	0	2286	2474
8	571	454	10	647	1682
9	250	0	0	2640	2890
10	154	2	0	1974	2130
11	82	0	0	2408	2490
12	18	0	0	2320	2338
13	568	0	18	2054	2640
14	8	6	10	5066	5090
15	372	4	0	2156	2532
18	0	52	0	2624	2676
20	0	8	0	2278	2286
21	0	8	0	1364	1372
71	414	0	0	986	1400

----- Southern District totals -----

19	3190	786	175	36589	40740
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Table 2. Numbers of male Tanner crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1993.

Station	Sublegal males						Legal males				Total legal	Total males
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit			
			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)		
1	2	4	5	2	34	3	48	0	5	0	53	103
2	11	20	15	0	17	0	13	0	1	0	14	77
3	20	9	9	0	8	1	16	0	1	0	17	64
4	92	1	10	2	36	3	25	2	2	0	29	173
5	36	1	0	1	17	1	17	0	5	0	22	78
6	67	13	40	0	15	3	5	1	2	0	8	146
7	97	20	17	1	24	2	18	2	0	0	20	181
8	4	2	12	0	15	28	23	91	6	8	128	189
9	16	1	4	0	25	0	54	0	11	0	65	111
10	158	5	5	0	21	0	35	0	3	0	38	227
11	135	17	7	0	3	1	5	0	1	0	6	169
12	45	2	0	0	0	1	2	2	0	0	4	52
13	0	7	22	1	22	29	17	57	7	4	85	166
14	6	1	0	2	0	2	0	1	0	0	1	12
15	0	2	11	5	14	44	9	74	0	8	91	167
71	42	13	3	2	28	21	71	10	11	2	94	203
District total	731	118	160	16	279	139	358	240	55	22	675	2118

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Tanner crab catch

Table 3. Numbers of female Tanner crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1993.

----- Mature -----														
Station	Juveniles	Full clutches			Partial clutches			Barren			Total mature			Total females
		New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	
1	3	0	0	0	0	0	0	0	0	0	0	0	0	3
2	18	0	0	0	0	0	0	0	0	0	0	0	0	18
3	25	0	0	0	0	0	0	0	0	0	0	0	0	25
4	86	0	0	0	0	0	0	0	0	0	0	0	0	86
5	37	0	0	0	0	0	0	0	0	0	0	0	0	37
6	80	1	4	1	0	0	0	0	0	0	1	4	1	86
7	70	0	0	2	1	1	0	0	0	1	1	1	3	75
8	3	10	153	14	0	7	4	0	0	0	10	160	18	191
9	19	1	12	20	0	0	5	0	0	0	1	12	25	57
10	123	0	0	1	0	0	0	0	0	0	0	0	1	124
11	164	10	0	0	0	0	0	0	0	0	10	0	0	174
12	34	0	0	0	0	0	0	0	0	0	0	0	0	34
13	15	45	274	30	0	0	0	0	0	0	45	274	30	364
14	1	0	0	0	0	0	0	0	0	0	0	0	0	1
15	3	4	48	5	0	1	0	0	0	0	4	49	5	61
71	40	4	14	46	0	0	41	0	0	6	4	14	93	151
District total	721	75	505	119	1	9	50	0	0	7	76	514	176	1487

-note- stations not listed had no female Tanner crab catch

Table 4. Numbers of male king crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1993.

Station	Sublegal males						Legal males				Total legal	Total males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
1	0	0	3	0	0	0	1	0	1	0	2	5
2	0	2	1	0	0	0	0	0	0	1	1	4
6	0	0	1	0	0	0	0	0	1	1	2	3
8	0	0	0	0	0	0	0	0	1	0	1	1
13	0	0	0	0	0	0	0	0	1	0	1	1
14	0	0	0	0	0	0	0	0	1	0	1	1
District total	0	2	5	0	0	0	1	0	5	2	8	15

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male king crab catch

Table 5. Numbers of female king crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1993.

		----- Mature -----												
Station	Juveniles	Full clutches			Partial clutches			Barren			Total mature			Total females
		New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	
1	1	2	0	0	8	0	0	0	0	0	10	0	0	11
2	2	1	0	0	5	1	0	0	0	0	6	1	0	9
6	0	0	0	0	1	0	0	0	0	0	1	0	0	1
District total	3	3	0	0	14	1	0	0	0	0	17	1	0	21

-note- stations not listed had no female king crab catch

Table 6. Numbers of male Dungeness crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1993.

Station	Sublegal males						Legal males				Total legal	Total males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
1	0	0	0	0	0	0	1	0	0	0	1	1
2	0	0	0	0	3	1	1	1	0	0	2	6
3	0	0	0	3	13	4	15	3	0	0	18	38
4	0	0	0	0	22	2	18	1	0	0	19	43
5	0	0	0	0	2	0	2	0	0	0	2	4
6	0	0	0	0	0	0	1	1	0	0	2	2
7	0	0	0	0	4	0	7	2	0	0	9	13
8	0	0	0	0	6	0	17	1	0	0	18	24
15	0	0	0	0	0	0	1	0	0	0	1	1
18	0	0	0	0	0	0	4	0	0	0	4	4
District total	0	0	0	3	50	7	67	9	0	0	76	136

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Dungeness crab catch

Table 7. Numbers of female Dungeness crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1993.

Station	Juveniles	----- Mature -----									Total mature			Total females
		Full clutches			Partial clutches			Barren			New	Old	VO	
		New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	
1	0	0	0	0	0	0	0	3	1	0	3	1	0	4
2	0	0	0	0	0	0	0	2	0	0	2	0	0	2
3	0	0	0	0	0	0	0	0	2	0	0	2	0	2
4	7	0	0	0	0	0	0	0	0	0	0	0	0	7
5	0	0	0	0	0	0	0	1	7	0	1	7	0	8
6	0	0	0	0	0	0	0	0	1	0	0	1	0	1
7	0	0	0	0	0	0	0	24	23	0	24	23	0	47
8	0	0	0	0	0	0	0	297	109	0	297	109	0	406
10	0	0	0	0	0	0	0	0	1	0	0	1	0	1
14	0	0	0	0	0	0	0	0	1	0	0	1	0	1
15	0	0	0	0	0	0	0	1	0	0	1	0	0	1
17	0	0	0	0	0	0	0	3	0	0	3	0	0	3
18	0	0	0	0	0	0	0	34	4	0	34	4	0	38
20	0	0	0	0	0	0	0	7	0	0	7	0	0	7
21	0	0	0	0	0	0	0	5	1	0	5	1	0	6
District total	7	0	0	0	0	0	0	377	150	0	377	150	0	534

-note- stations not listed had no female Dungeness crab catch

Table 8. Target species catch in pounds by station in the Kamishak District, Cook Inlet trawl survey, 1993.

Station no.	Tanner	Dungeness	King	Misc. invertebrates, fish & debris	Total catch
31	2	0	0	782	784
32	8	0	0	700	708
37	200	0	0	1180	1380
44	0	0	0	512	512
47	14	0	0	752	766
51	22	0	0	2680	2702
52	36	0	0	1978	2014
53	12	0	1	987	1000
54	0	0	0	398	398
56	130	0	0	1436	1566
58	78	0	8	570	656
59	4	0	0	881	885
60	1	0	0	134	135
61	4	0	0	1138	1142
67	34	0	0	1112	1146
68	15	0	0	697	712

----- Kamishak District totals -----

16	560	0	9	15937	16506
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Table 9. Numbers of male Tanner crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1993.

Station	Sublegal males						Legal males				Total legal	Total males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
31	0	1	0	0	0	1	0	0	0	0	0	2
32	1	0	0	3	0	2	0	0	0	0	0	6
37	0	0	2	14	1	102	0	18	0	0	18	137
47	0	2	5	3	2	3	0	0	0	0	0	15
51	0	1	14	0	4	3	0	0	0	0	0	22
52	0	1	9	4	8	6	0	2	0	0	2	30
53	4	2	1	2	4	1	0	0	0	0	0	14
56	0	12	54	5	3	4	0	2	0	0	2	80
58	34	16	39	13	5	5	2	0	0	0	2	114
59	1	1	2	0	1	0	0	0	0	0	0	5
60	1	0	0	0	0	0	0	0	0	0	0	1
61	5	0	1	0	2	0	1	0	0	0	1	9
67	3	2	7	9	1	5	0	0	0	0	0	27
68	28	0	0	1	4	1	3	0	0	0	3	37
District total	77	38	134	54	35	133	6	22	0	0	28	499

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Tanner crab catch

Table 10. Numbers of female Tanner crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1993.

Station	Juveniles	----- Mature -----									Total mature			Total females
		Full clutches			Partial clutches			Barren			New	Old	VO	
		New	Old	VO	New	Old	VO	New	Old	VO				
37	0	0	0	1	0	0	0	0	0	0	0	0	1	1
51	2	1	0	0	0	0	0	0	0	0	1	0	0	3
52	0	1	0	0	0	0	0	0	0	0	1	0	0	1
53	6	2	0	0	0	0	0	0	0	0	2	0	0	8
56	4	131	3	0	0	0	0	0	0	0	131	3	0	138
58	35	31	0	0	0	0	0	0	0	0	31	0	0	66
59	5	1	0	0	0	0	0	0	0	0	1	0	0	6
60	2	0	1	0	0	0	0	0	0	0	0	1	0	3
67	5	2	36	0	0	0	0	0	0	0	2	36	0	43
68	41	0	0	0	0	0	0	0	0	0	0	0	0	41
District total	100	169	40	1	0	0	0	0	0	0	169	40	1	310

-note- stations not listed had no female Tanner crab catch

Table 11. Numbers of male king crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1993.

Station	----- Sublegal males -----						----- Legal males -----				Total legal	Total males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
53	1	0	0	0	0	0	0	0	0	0	0	1
58	0	0	0	0	0	0	0	0	1	0	1	1
District total	1	0	0	0	0	0	0	0	1	0	1	2

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male king crab catch

Table 12. Tanner crab population estimates in numbers by sex, size and age classes, 1993 Cook Inlet trawl survey.

Males	Southern District	Kamishak and Barren Is. District
<u>Sublegal</u>		
<70 mm	599,873	298,382
70 - 91 mm	89,299	151,385
91 -114 mm		
new	120,343	523,487
o & vo	12,548	211,521
115 -139 mm		
new	215,292	137,821
o & vo	109,962	530,615
<u>Legal</u>		
140 -164 mm		
new	280,719	23,387
o & vo	185,496	87,287
≥166		
new	41,158	0
o & vo	16,946	0
<u>Total legals</u>	524,319	110,674
<u>Total Males</u>	1,671,636	1,963,885
<u>FEMALES</u>		
Juveniles	573,958	389,426
Adults	600,634	826,705
<u>Total Females</u>	1,174,592	1,216,131

Table 13. Tanner crab catch (pounds) by season, Cook Inlet Management Area, 1968-93.

Season	Southern District	No. of Vessels	Kamishak/ Barren Is. District	No. of Vessels	Outer/ Eastern District	No. of Vessels	Central District	No. of Vessels	Total Catch	Total Vessels
1968-69	1,388,282		12,398		816				1,401,496	
1969-70	1,147,154		71,196		104,191				1,322,541	
1970-71	1,046,803		541,212		3,000				1,591,015	
1971-72	2,462,956		974,962		804,765				4,242,683	
1972-73	2,935,662		3,361,023		1,266,023				7,562,708	
1973-74	1,387,535		4,689,251		1,891,021				7,967,807	
1974-75	967,762		2,150,462		656,660				3,774,884	
1975-76	1,339,245		3,281,084	17	850,964				5,471,293	57
1976-77	2,009,633	35	1,765,926	24	824,520				4,600,079	67
1977-78	2,806,568	55	2,077,092	28	502,049				5,385,709	92
1978-79	2,323,420	75	2,713,339	27	694,728				5,731,487	77
1979-80	1,134,940	68	3,338,623	24	595,645				5,069,208	68
1980-81	1,047,630	46	1,757,331	20	463,201				3,268,162	52
1981-82	548,529	41	1,286,332	18	524,897	9			2,359,758	51
1982-83	584,908	48	1,693,794	20	682,919	20			2,961,621	65
1983-84	996,763	45	1,373,674	17	443,384	14			2,813,821	71
1984-85	1,229,298	83	1,535,547	19	259,083	7			3,023,928	86
1985-86	1,164,261	103	1,288,711	24	177,041	5			2,630,013	109
1987	1,077,379	87	1,111,339	21	251,174	13	7,771	2	2,447,663	95
1988	944,763	127	417,182	24	168,969	23	8,396	3	1,539,310	137
1989	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--	0	--
1990	CLOSED	--	510,034	7	CLOSED	--	CLOSED	--	510,034	7
1991	271,379	68	266,106	8	CLOSED	--	CLOSED	--	537,485	71
1992	354,868	110	CLOSED	--	53,049	16	CLOSED	--	407,917	121
1993	534,003	136	CLOSED	--	CLOSED	--	CLOSED	--	534,003	136
Average ¹	1,001,667	66	1,243,237	17	331,803	9	2,310	1	2,577,659	73

¹ Since inception of minimum legal size between the 1976-77 season.
Includes closed seasons.

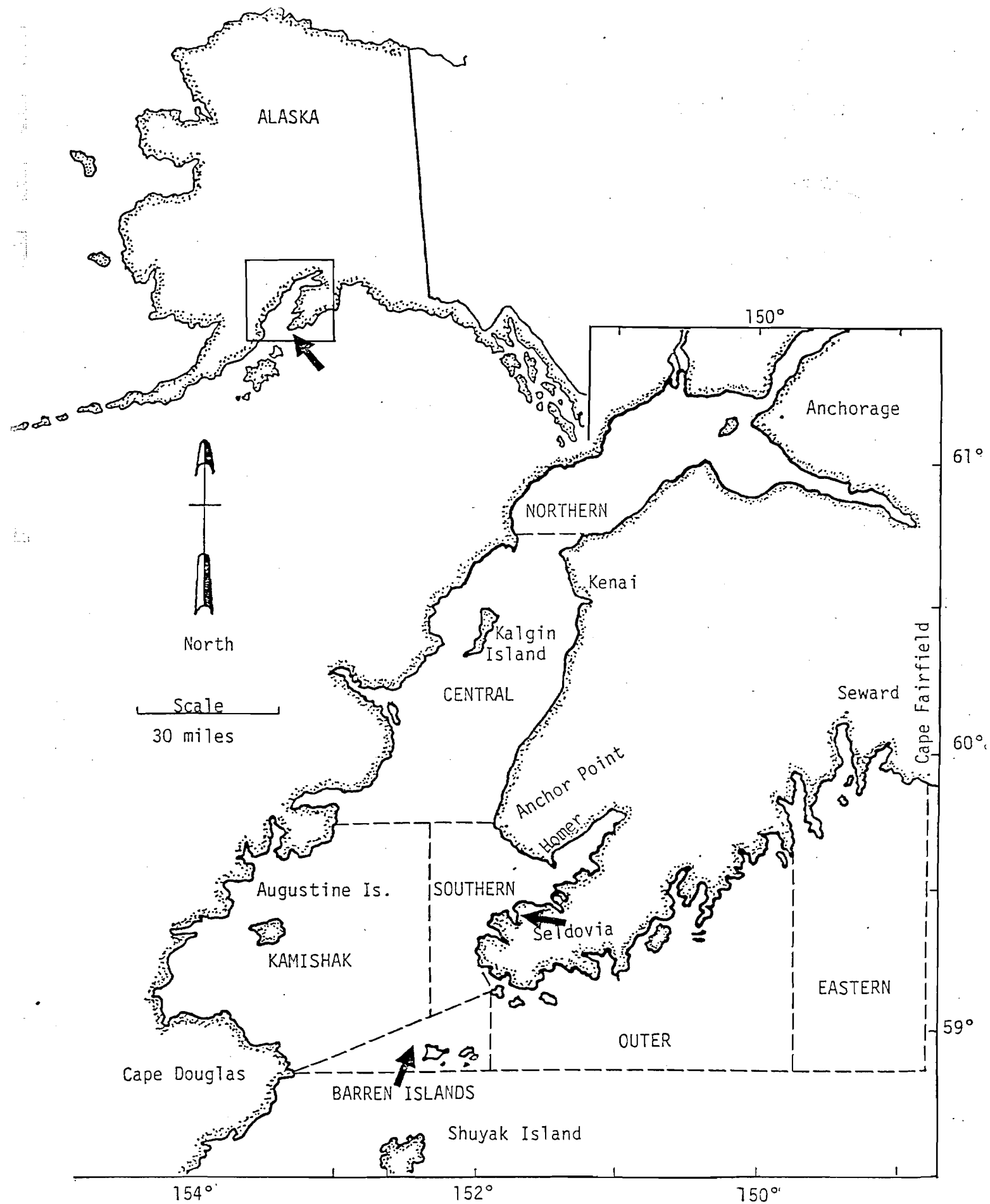


Figure 1 Cook Inlet area district location chart.

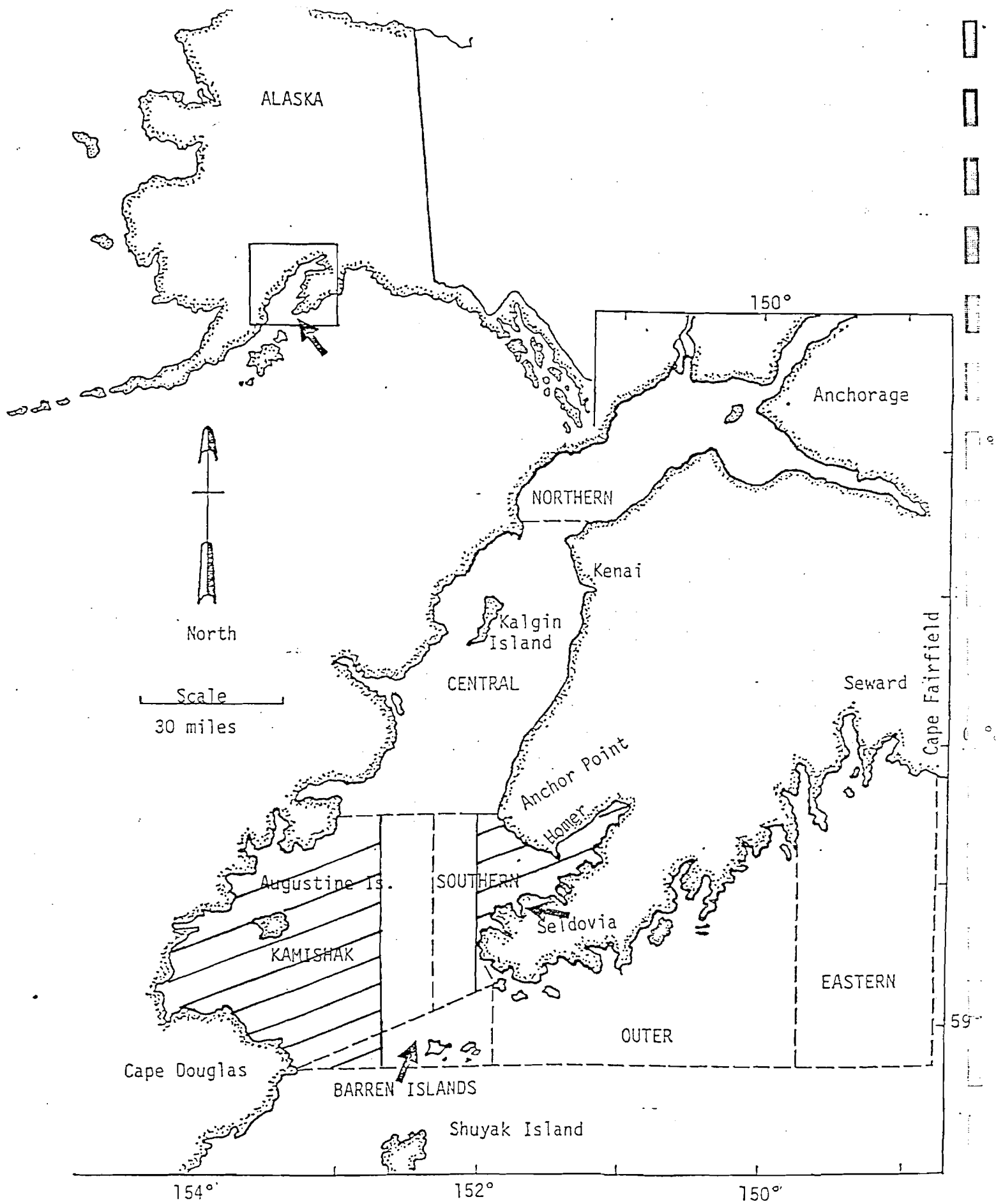


Figure 2. Cook Inlet crab trawl survey locations.

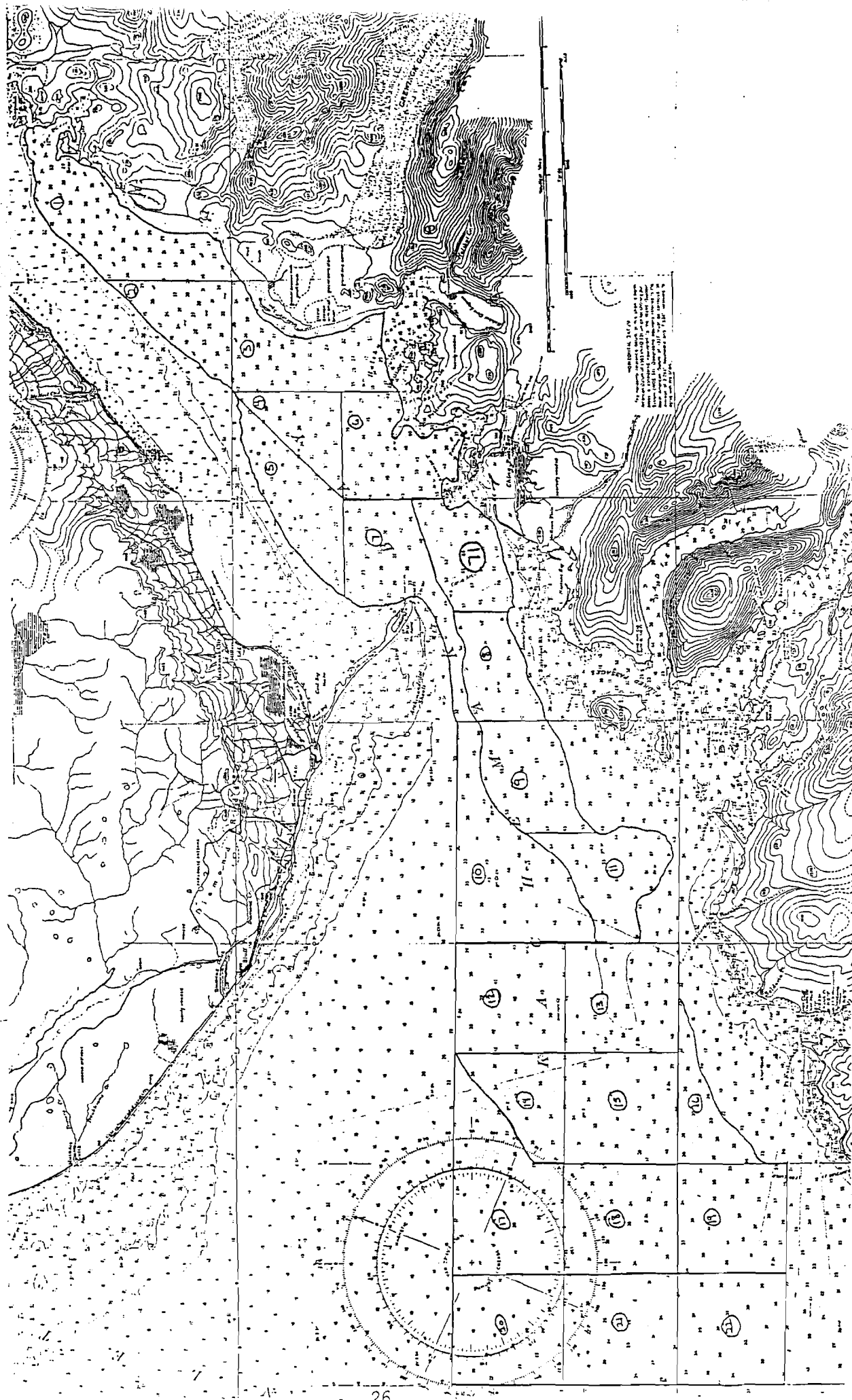


Figure 3. Southern District crab trawl survey stations.

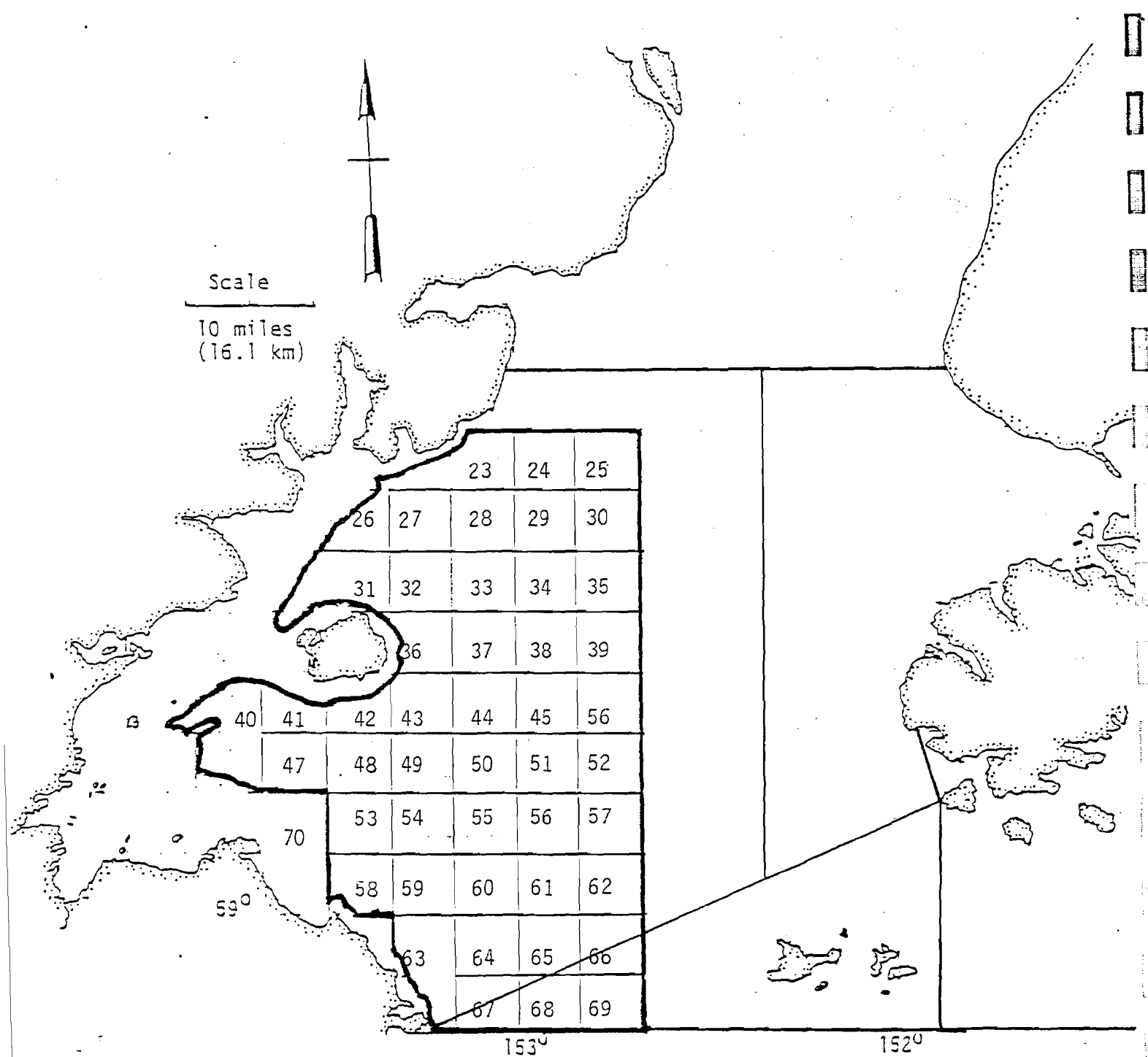


Figure 4. Kamishak and Barren Islands Districts crab trawl survey stations.

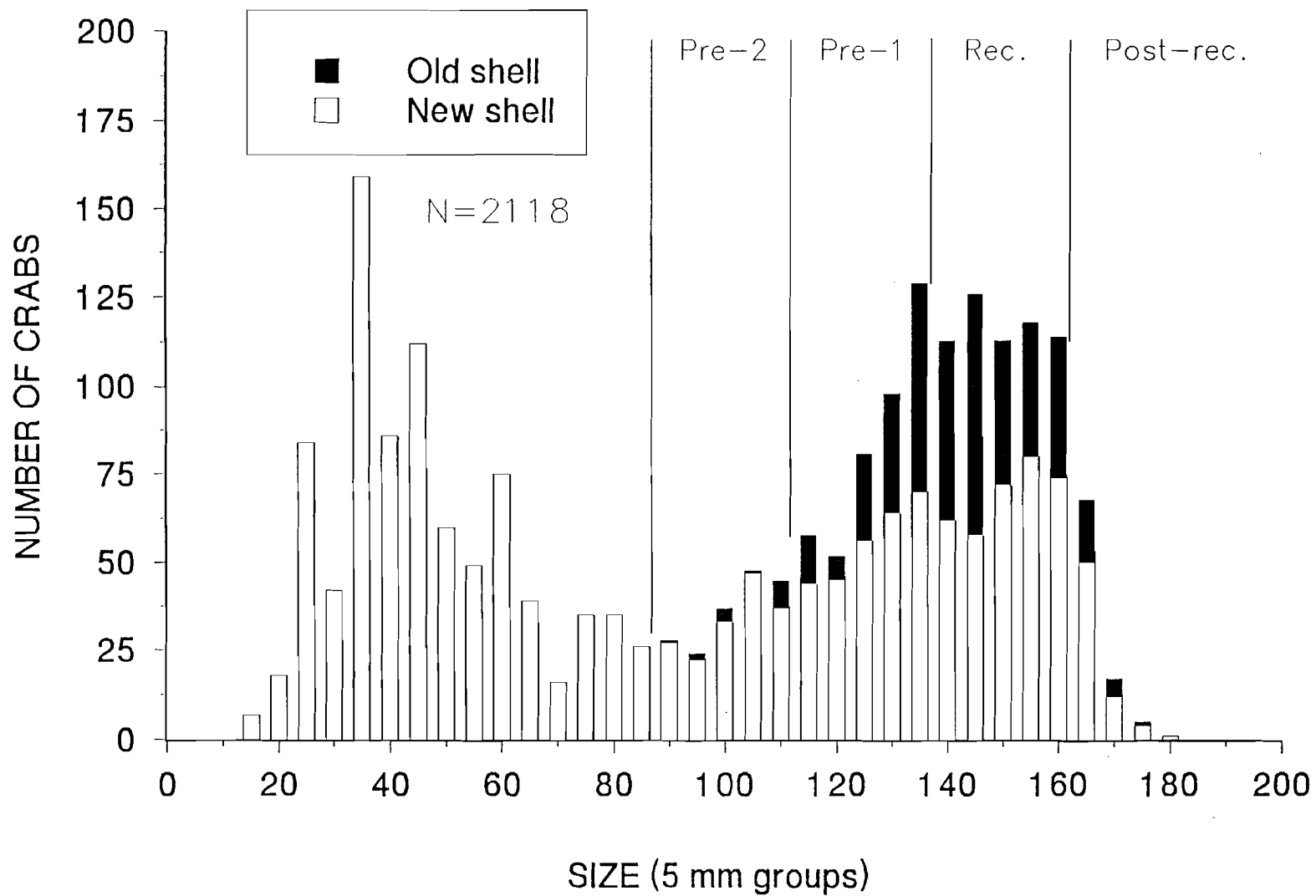


Figure 5. Male Tanner crab catch, Southern Distr., 1993 Cook Inlet trawl survey.

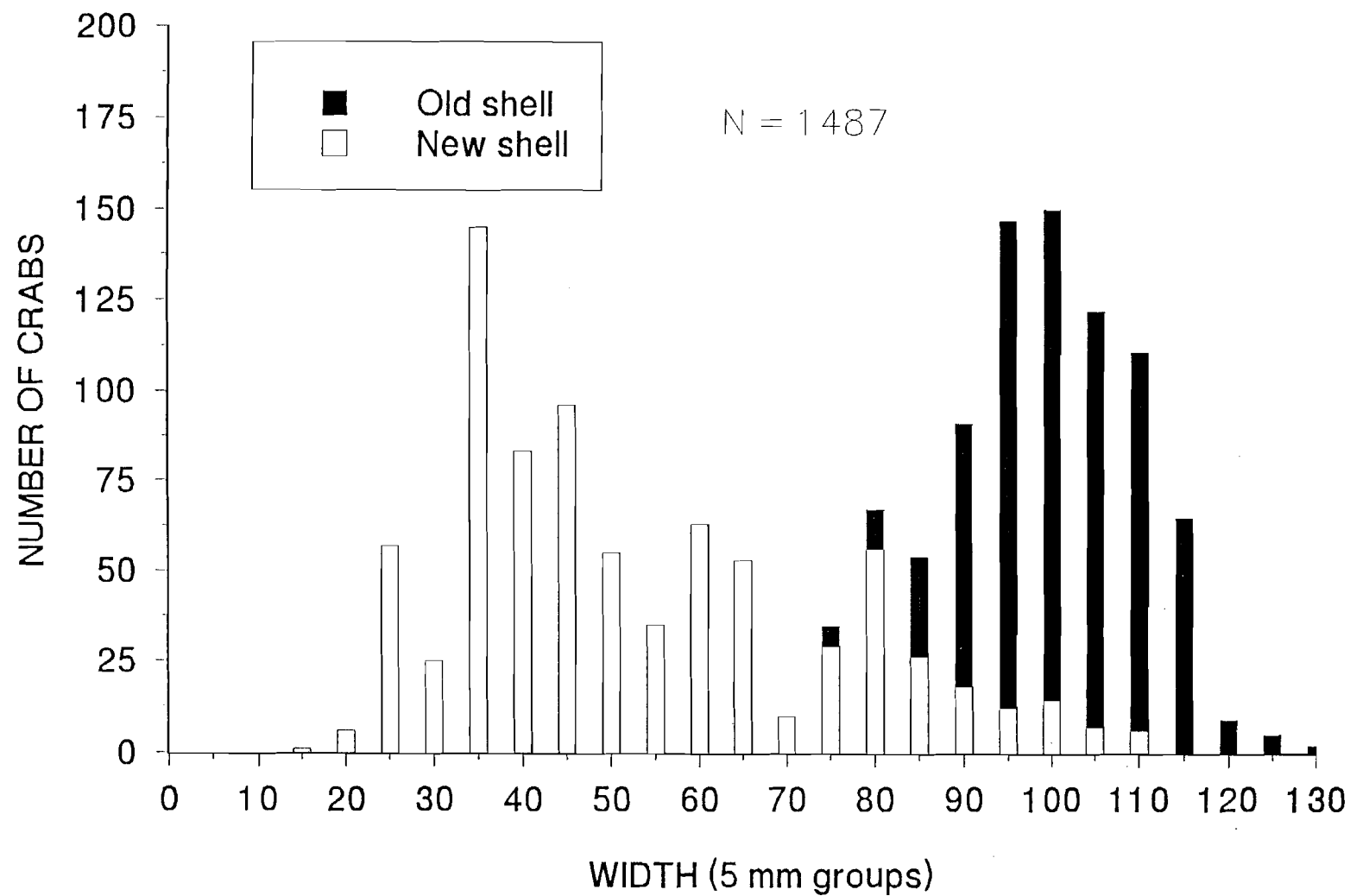
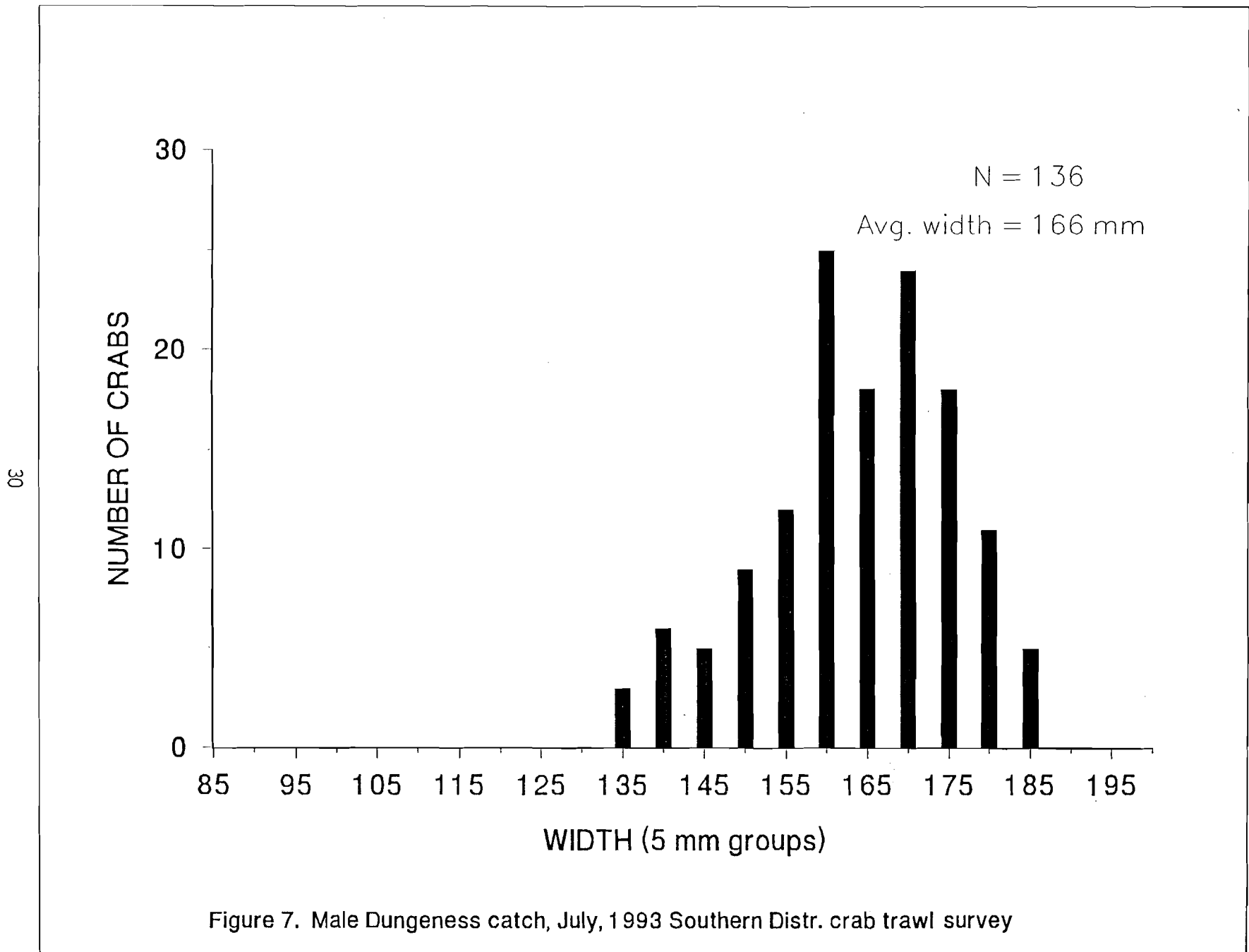


Figure 6. Female Tanner crab catch, Southern Distr., 1993 Cook Inlet trawl survey.



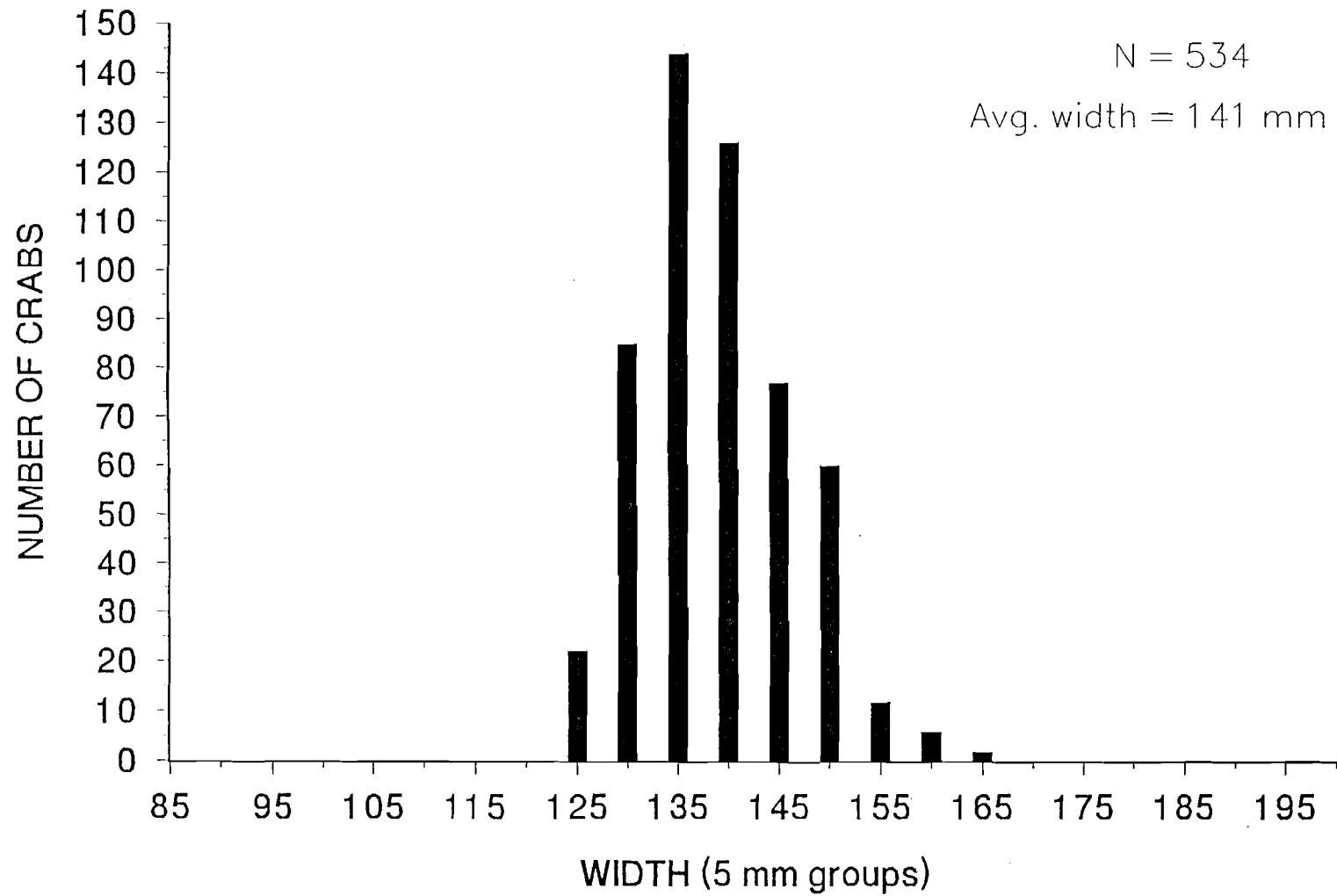


Figure 8. Female Dungeness catch, July, 1993 Southern Distr. crab trawl survey.

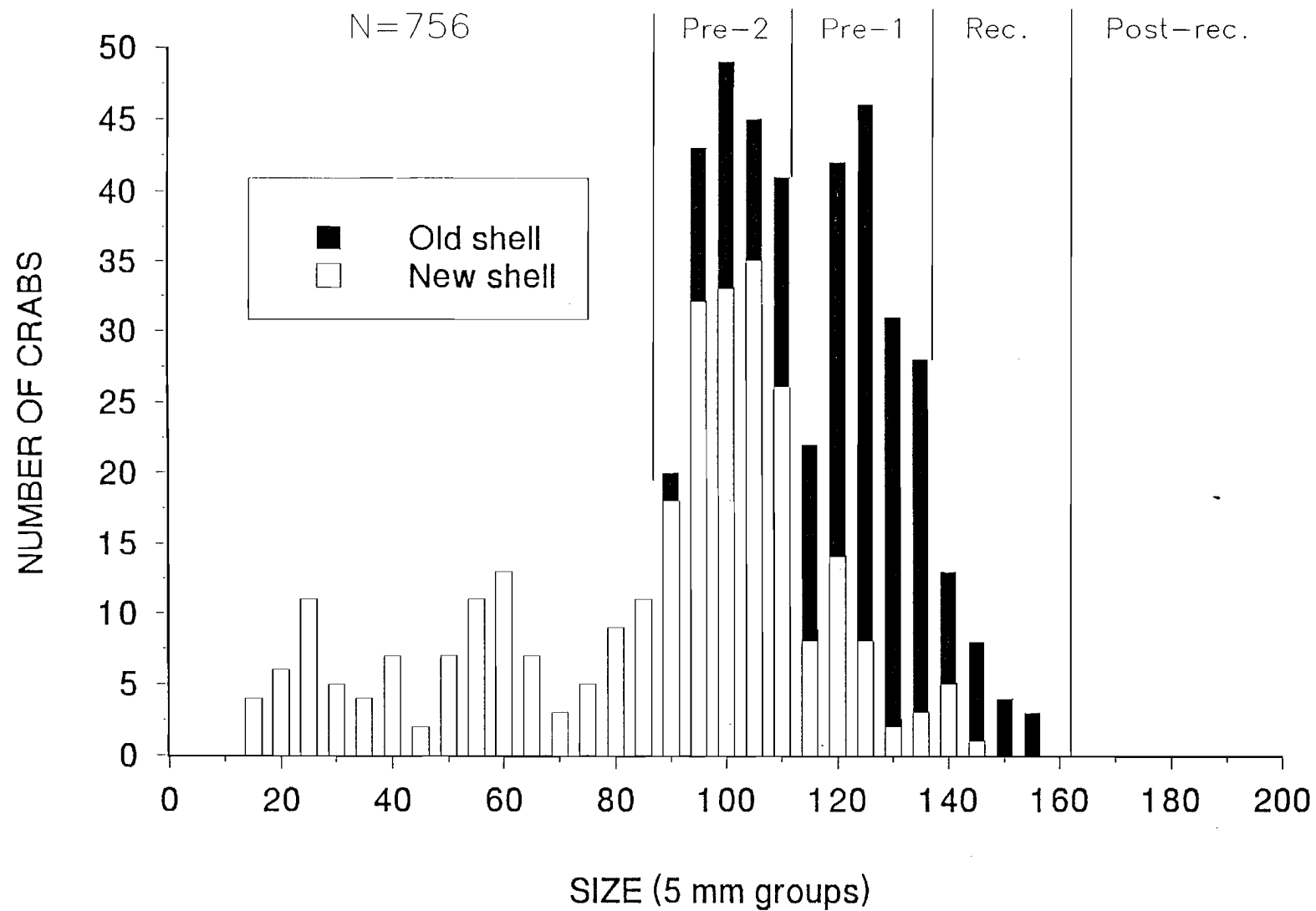


Figure 9. Male Tanner crab catch, Kamishak District, 1993 Cook Inlet trawl survey.

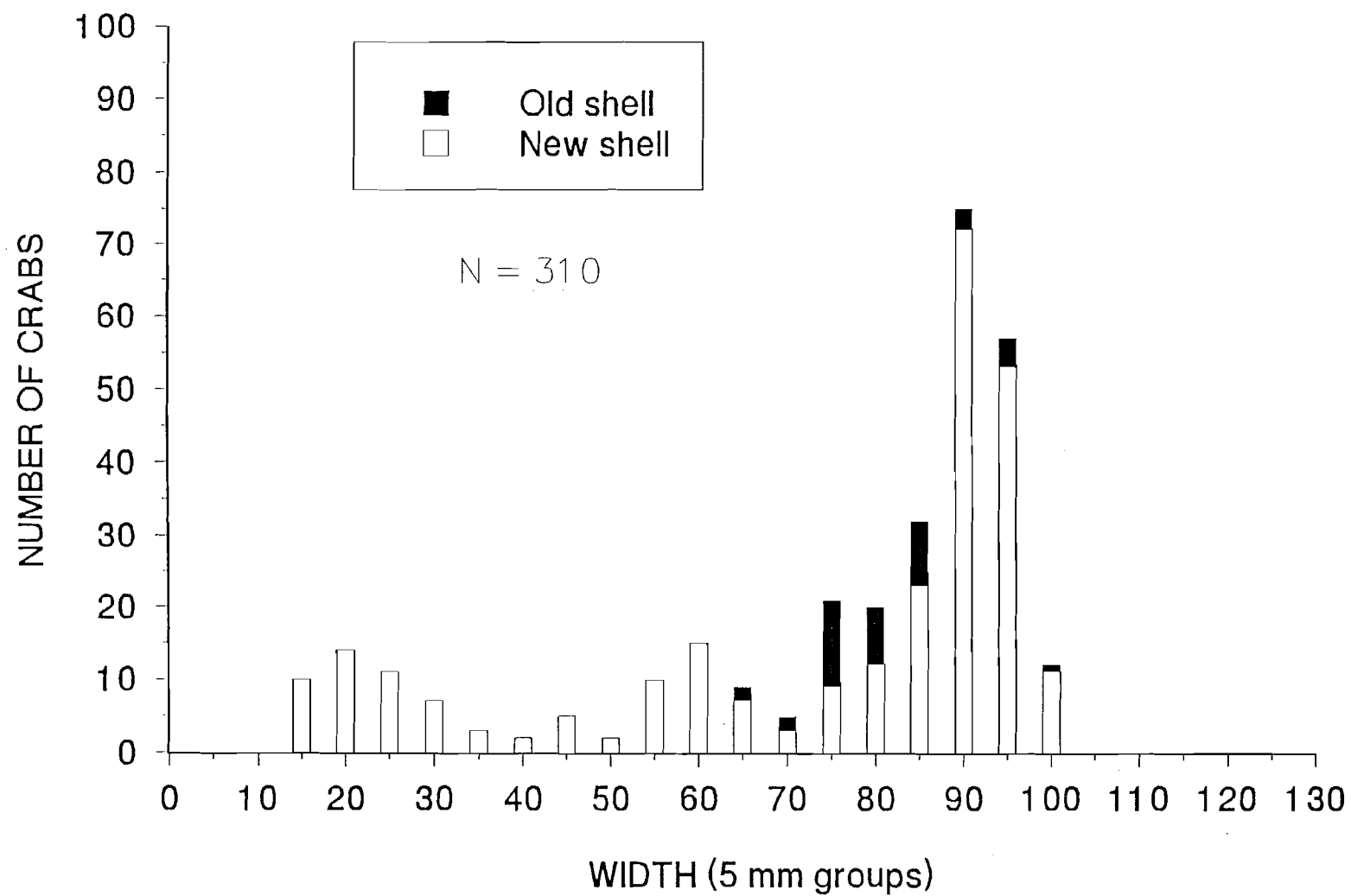


Figure 10. Female Tanner crab catch, Kamishak Distr., 1993 Cook Inlet trawl survey.

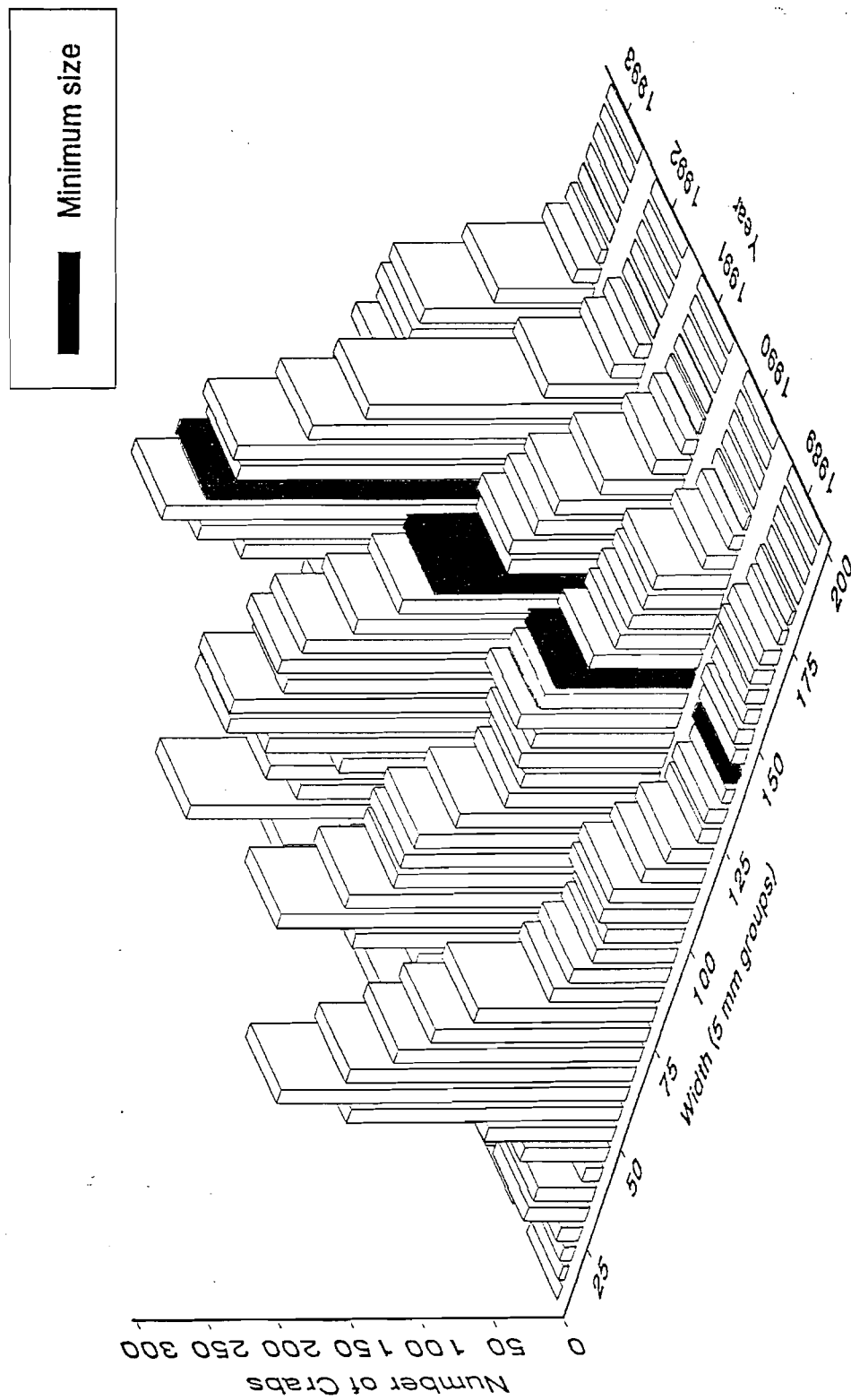


Figure 11. Male Tanner catch, 1989-1993, Southern Distr. trawl surveys.

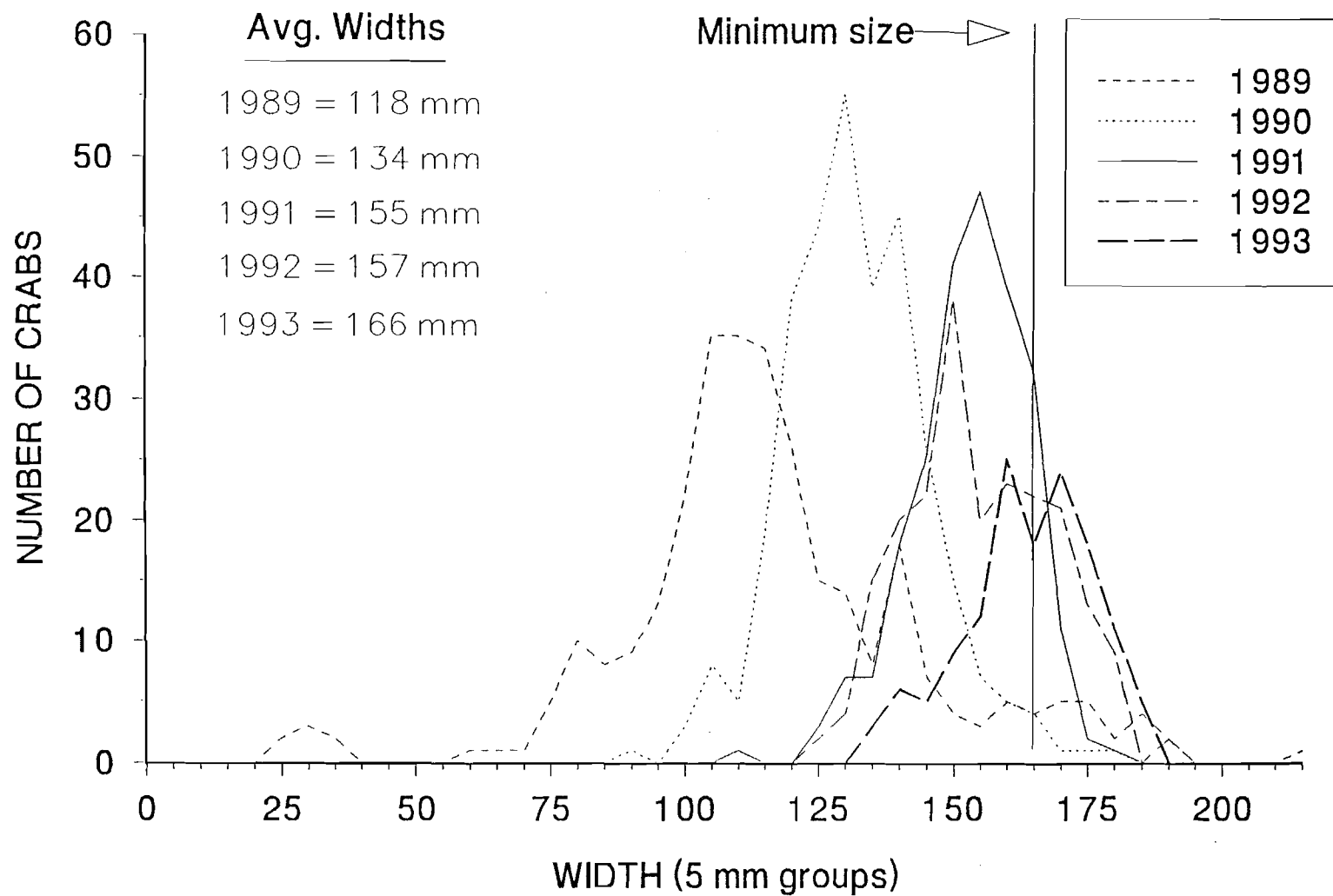


Figure 12. Male Dungeness catch, 1989 - 93, Southern Distr. trawl survey.

Appendix A. Fishing log and catch (lbs.) by station in the Southern District, 1993 Cook Inlet trawl survey.

Station	Area (sqnm)	Date	Latitude (start)		Longitude (start)		Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
1	7.15	07/06/93	59	43.16	151	06.56	190	29	1.00	34	40	1472
2	3.59	07/06/93	59	40.94	151	10.67	190	28	1.00	29	32	1098
3	5.52	07/07/93	59	37.50	151	14.35	340	27	1.00	31	34	1086
4	2.63	07/07/93	59	37.71	151	18.00	33	22	0.79	34	34	1986
5	4.2	07/06/93	59	38.43	151	18.80	210	30	1.00	16	20	932
6	5.	07/07/93	59	37.07	151	17.91	200	30	1.00	39	40	2166
7	5.41	07/12/93	59	36.44	151	21.07	25	28	1.00	39	40	2474
8	3.57	07/08/93	59	34.15	151	28.61	60	28	1.00	67	68	1682
9	4.59	07/08/93	59	33.59	151	31.76	195	28	1.00	69	70	2890
10	8.52	07/08/93	59	33.99	151	35.32	205	28	1.00	46	46	2130
11	4.63	07/12/93	59	32.06	151	36.16	210	27	1.00	54	57	2490
12	6.25	07/09/93	59	33.21	151	43.22	45	28	1.00	39	45	2338
13	6.25	07/14/93	59	31.57	151	40.95	223	28	1.00	55	58	2640
14	3.97	07/09/93	59	33.36	151	47.64	25	30	1.00	38	40	5090
15	6.25	07/14/93	59	31.83	151	45.70	202	30	1.00	41	43	2532
17	8.94	07/09/93	59	33.28	151	50.87	212	28	1.00	24	31	3162
18	6.25	07/13/93	59	31.86	151	50.96	200	26	1.00	36	36	2676
20	6.25	07/13/93	59	33.51	151	57.20	187	30	1.00	20	22	2286
21	6.25	07/13/93	59	31.36	151	55.60	200	26	1.00	32	35	1372
71	4.	07/07/93	59	35.16	151	20.31	202	30	1.00	71	74	1400

Number of stations: 20
Total area (sqnm): 109.22
Total catch (lbs): 43902

Appendix B. Fishing log and catch (lbs.) by station in the Kamishak District, 1993 Cook Inlet trawl survey.

Station	Area (sqnm)	Date	Latitude (start)		Longitude (start)		Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
31	26.12	06/29/93	59	27.69	153	25.77	270	28	1.00	12	13	784
32	26.12	06/29/93	59	27.34	153	16.77	110	30	1.00	18	19	708
37	26.12	07/03/93	59	21.33	153	05.80	62	28	1.00	26	26	1380
44	26.12	07/03/93	59	16.90	153	03.08		21	0.90	26	30	512
47	26.12	06/28/93	59	13.82	153	36.73	145	28	1.00	18	19	766
51	26.12	06/29/93	59	11.84	152	54.06	305	27	1.00	62	70	2702
52	26.12	06/29/93	59	12.78	152	43.87	300	28	1.00	61	66	2014
53	26.12	06/28/93	59	07.79	153	27.84	130	30	1.00	22	24	1000
54	26.12	07/01/93	59	06.56	153	16.78	130	24	0.89	23	23	398
56	26.12	06/29/93	59	07.92	152	55.21	300	31	1.00	75	77	1566
58	24.74	06/27/93	59	03.65	153	25.48	85	28	1.00	23	26	656
59	26.12	06/27/93	59	03.56	153	17.66	120	30	1.00	33	37	885
60	26.12	06/27/93	59	02.16	153	04.55	125	16	0.50	76	77	135
61	26.12	07/01/93	59	02.50	152	54.19	105	30	1.00	84	86	1142
67	26.12	06/30/93	58	53.47	153	06.44	284	28	1.00	92	92	1146
68	26.12	06/30/93	58	53.38	152	55.89	235	28	1.00	90	91	712

Number of stations: 16
 Total area (sqnm): 416.54
 Total catch (lbs): 16506

Appendix C. Data logger temperature recordings from the 1992-93
Cook Inlet crab trawl surveys.

Date	Station	Temp. (°C)	Depth (fm)
KAMISHAK DISTRICT			
7/19/92	61	6.7	82
7/20/92	67	6.3	90
7/21/92	53	9.3	24
6/28/93	53	8.2	22
6/29/93	31	10.2	12
6/30/93	67	5.5	92
7/1/93	54	8.8	23
7/3/93	44	8.0	26
SOUTHERN DISTRICT			
7/15/92	4	7.5	32
7/16/92	7	7.5	37
7/17/92	10	7.8	47
7/18/92	11	7.9	55
7/6/93	5	6.9	16
7/7/93	4	6.7	34
7/8/93	8	6.6	67
7/12/93	7	7.1	39
7/13/93	18	8.4	36
7/14/93	15	7.6	41

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